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THE MUSHROOM GROWERS'
ASSOCIATION

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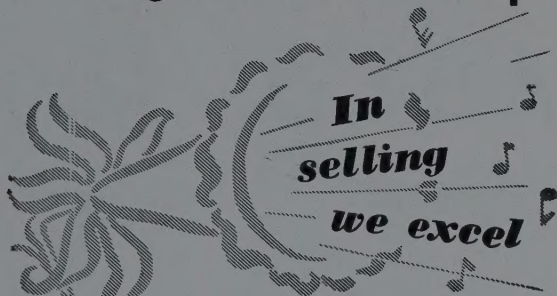
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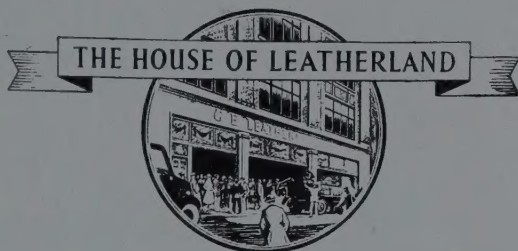
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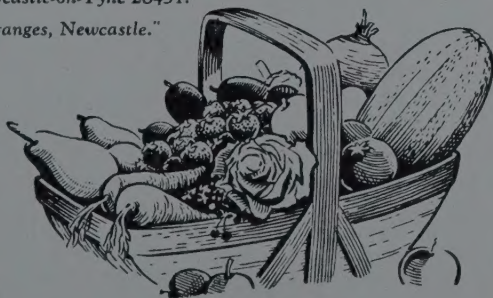
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EDITORIAL

UNCERTAINTY

The recent statement by the Minister of Agriculture when addressing an agricultural conference in Norfolk—that “factory type” production units will not qualify for Government help in the form of the 33½ per cent. farm improvement grants and that these grants were intended to be “a contribution to the programme of modernisation of permanent equipment linked directly to the land” inevitably affect the mushroom grower as well as other specialists in the field of horticulture and the sooner the exact position is clarified the better it will be for all concerned.

That doubt and uncertainty exist there is no doubt and it has already become quite evident that many mushroom farm improvement schemes are remaining in the blue print stage until the situation regarding the grants is made clearer.

At the moment it seems that actual growing houses and the like will be excluded from grant whereas packing sheds, dutch barns, roads, water, electricity supplies and so on will qualify.

Somewhere and at some time, somebody is going to have the thankless task of deciding whether, for instance, a Danish type large pig unit, turning out baconers with factory-like precision, has any more right to the grant than a mushroom house, also factory-like in its production. Has a packing shed dealing with lettuce, potatoes, and the like any prior claim over a mushroom packing shed?

At a date which many feel is much too far distant, a County Agricultural Executive Committee will have to decide—or submit the problem to the Ministry for a final decision—just which and what will qualify, but the sooner clarification is achieved the better.

WRA

RUBBISH DUMP APPEAL

Hearing Lasts Four Days

The present mushroom production of the Linfield Companies at Thakeham and Sompting, Sussex, was revealed as over 5,000,000 lb. during the hearing of an appeal by four Sussex Local Authorities against the West Sussex County Council's refusal, as planning authority, to allow the erection of a domestic refuse disposal plant on the Downs at Sompting, near Worthing.

In all the hearing, conducted by Mr. J. Sumner on behalf of the Ministry of Housing and Local Government, lasted four days.

The nursery of Messrs. A. G. Linfield (Sompting) Ltd., at Halewick, produces about a quarter of the Linfield output of mushrooms.

Mr. Arthur George Linfield, C.B.E., of Oast House, Ashington, said he was a director of the Halewick Lane nursery. His father founded the firm in 1882. They also had a nursery at Thakeham. When the nursery at Halewick was started in 1943-44 there was already a refuse disposal plant on the site. In 1947 he entered into an agreement with the Worthing R.D.C. to take pulverised tailings from the plant, but the expectations of its value were not fulfilled. The agreement was later rescinded. Mr. Linfield later said his firm was the third and perhaps the second largest mushroom growing firm in the world and it was no light suggestion to say that the welfare of his 105 workers at Halewick were threatened if the new refuse plant was opened near them. He estimated that the closing down of the Halewick nursery would make 70 to 75 of these redundant as there would be no work for them.

Mr. Linfield spoke of the extra precautions which had to be taken at Halewick because of the incidence of mushroom diseases and he attributed the greater part of this to contamination from the refuse dump already in the area. Later he said that when describing his firm as the second or third largest mushroom producing concern in the world he meant the whole organisation and not just the Halewick nursery.

At the final day's hearing Mr. James A. Linfield, also a director of Messrs. A. G. Linfield Ltd., said there was no doubt that the threat to the Halewick Lane nursery at Sompting was very serious. There were other branches of the firm at Worthing and Thakeham, but at Halewick Lane they had a quarter of their mushroom production. Total mushroom production of the firm was over 5,000,000 lb. each year.

Mr. Harold Brown, Q.C., counsel for Messrs. Linfield, said in his closing speech that in addition to threatening the existence of the mushroom nursery the proposed tip was "an attempt to propagate a gross violation of the 'Sussex Downs'."

At the end of the enquiry the Inspector said he would examine the site and alternative sites suggested, and would also visit the mushroom nurseries of Messrs. A. G. Linfield (Sompting) Ltd.

This appeal concerned the use of 41 acres of land at Halewick Lane, Sompting.

The decision of the Inspector will be announced in due course.

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FREIGHT CHARGES—IRISH MUSHROOMS

In last month's Bulletin the freight charge on mushrooms by air from Eire was stated to be 3d.—3½d. plus any additional charge to and from the airports. Airport clearance plus these extra freight charges amount to a further 2d. per lb., making the all-in carriage between 5d. and 6d. per lb. As the average price on the market amounted to 3/1d. per lb., the actual return to the grower, with carriage charges deducted, would be from 2/7d. to 2/8d.

SOUTHPORT REFRESHER COURSE AND CONFERENCE

Something for Everybody

The Southport Refresher Course and Conference to be held on 2nd and 3rd October is already attracting widespread attention and the preliminary programme is printed herewith.

It will be seen that the programme, aptly headed "Mushroom Developments Conference," covers a wide field and many of the subjects like "Polythene and Mushroom Growing," "Liquid Activators for Synthetic Composts" and "A New Approach to Packing" are pointers to the advances which have and are being made in the industry with an eye to the future. Subjects like "What is Brown Disease?" and "Preliminary Observations on the Cecid Problem" are constant reminders of the many ever present problems over which extreme watchfulness has to be maintained. Growers planning expansion will note with satisfaction that one of the talks is being devoted to "Buildings for Mushroom Growing."

Admission to the conference will be free to members of the MGA and those nominated by members, but all members are reminded that admission will be by ticket only. Members who require more than one ticket must nominate by name those whom they intend to bring. Non-members will be charged 5 guineas for each ticket and the one ticket will admit one person to all the lectures and discussions.

The Conference takes place in the ballroom of the Prince of Wales Hotel, Southport, where most of the members will be staying. This hotel, headquarters of the conference proceedings, is now open to take bookings and **members are advised to make their own reservations direct to the hotel**, with the exception of members of the MGA Executive Committee for whom a block booking has been made.

It has been decided not to hold a communal luncheon or dinner and members are therefore advised to take the all-in special conference terms offered by the hotel. Bed and breakfast will cost 35/- per person per night (de luxe rooms 39/6) and daily inclusive terms are 47/- (de luxe 50/-). A private bathroom will cost 7/6d. per night. Ten per cent. is added for gratuities.

All members will be advised when to apply for admission tickets.

PROGRAMME

MUSHROOM DEVELOPMENTS CONFERENCE

WEDNESDAY, 2nd October:

First Session:

- 10.00 a.m. Opening by MGA Chairman, **G. V. Allen**, who will preside.
 10.05—10.25 **Robert G. Darlington** (W. Darlington & Sons Ltd., Worthing): Subject to be announced later.
 10.25—10.35 Discussion.
 10.35—10.50 **Frank W. Allerton** (Geo. Monro Ltd., Waltham Cross): *Polythene and Mushroom Growing*.
 10.50—11.00 Discussion.
 11.00—11.20 **P. B. Flegg** (soil chemist, Glasshouse Crops Research Institute, Littlehampton): *Casing-layer additives* (provisional title).
 11.20—11.30 Discussion.
 11.30—11.45 **F. G. Smith** (Director, Stockbridge House Experimental Horticulture Station, Yorkshire): *Casing Experiments at Stockbridge House*.
 11.45—11.55 Discussion.
 11.55—12.10 **G. F. Sheard** (Director, Fairfield Experimental Horticulture Station, Lancs.): *The new Mushroom Unit at Fairfield*.
 12.10—12.20 Discussion.

LUNCH INTERVAL

- 2.00—4.00 Machinery Demonstration at Bandstand.
Second Session: (F. Bleazard in the chair).
 4.15—4.35 **Miss D. G. Gandy** (microbiologist, GCRI, Littlehampton): *The Investigation of some Mushroom Disorders* (provisional title).
 4.35—4.55 **Dr. I. F. Storey** (plant pathologist, NAAS, Derby): *What is Brown Disease?*
 4.55—5.15 Discussion.
 5.15—5.35 **T. G. Figgis** (West Byfleet): *Air and the Mushroom*.
 5.35—5.45 Discussion.
 7.00 Presentation of Cups by the Mayor of Southport.

THURSDAY, 3rd October:

Third Session: (F. C. Atkins in the chair):

- 10.00—10.30 **M. C. Luxmoore** (Snowcap Mushrooms Ltd., Yaxley): *MRA Synthetic Composting*.
 10.30—10.40 Discussion.
 10.40—11.30 **Dr. W. Arnold** (Director of Mushroom Research, Dieskau, East Germany): *Mushroom Composts based on Peat and other materials*.
 11.30—11.45 Discussion.
 11.45—12.05 **S. E. Lake** (Plant Protection Ltd.): *Liquid Activators for Synthetic Composts*.
 12.05—12.15 Discussion.
 12.15—12.35 **K. G. Hartley** (Tavak Products, Woking): *A New Approach to Packing*.
 12.35—12.45 Discussion.

LUNCH INTERVAL

Fourth Session (S. Middlebrook in the chair):

- 2.10—2.30 **Dr. N. W. Hussey** or **Mr. Wyatt** (entomologist, GCRI, Littlehampton): *Preliminary Observations on the Cecid Problem* (provisional title).
 2.30—2.40 Discussion.
 2.40—3.00 **S. A. F. Sampson** (S. A. F. Sampson Ltd., Oving): *Buildings for Mushroom Growing*.
 3.00—3.10 Discussion.
 3.10—3.30 **Fred. C. Atkins** (Noble Mushrooms Ltd., Yaxley): *Problems facing the Beginner*.
 3.30—3.40 Discussion.
 3.40 Closing of Conference by MGA Chairman, **G. V. Allen**.

MUSHROOM SCIENCE 1

From time to time the MGA Secretary receives enquiries for Mushroom Science 1 (Proceedings of the First International Conference on Scientific Aspects of Mushroom Growing held at Peterborough, in May, 1950). This publication has been out of print for a long time and is no longer obtainable, but the MGA Secretary would be willing to pay a reasonable price for any second-hand copies which members may be willing to part with.

Reprinted from "SCIENTIFIC HORTICULTURE," Vol. XII.

THE MUSHROOM AND ITS ENVIRONMENT

BY R. L. EDWARDS, Ph.D., F.R.I.C.

(Formerly Director of MRA Mushroom Research Station, Yaxley, Peterborough)

This title embraces a very wide field and it is therefore proposed to outline what constitutes the environment of the growing cultivated mushroom. The discussion is confined almost entirely to physical aspects of the environment, and to the fruiting stage of growth.

The mushroom grows in three different media: the compost, usually in beds four to eight inches thick; the casing which lies upon it, usually one to two inches thick; and the air above the casing.

The Compost

Physically the compost is made up mainly of fragments of straw which have been through the composting process, in the case of horse manure this also contains undigested residues from the horse's food, together with microbial tissue from the micro-organisms which have grown during composting. Its main function is to supply the mushroom with food material and a medium in which the mycelium can spread and from which it can draw its nutriment. The mushroom is an aerobic organism, and its mycelium in compost has quite a high rate of respiration, so the compost must be porous enough for the necessary exchange of oxygen and carbon dioxide to take place.

Little or nothing has been done to study systematically the effect of the physical characteristics of the compost on the mushroom. It would be a matter of very considerable technical difficulty to carry out experiments in which the porosity of mushroom compost in the beds was varied according to a pre-arranged plan.

This is one of the variables in mushroom growing which is still practically untouched experimentally, and in practice depends entirely on the judgement of the grower. It is quite possible to make a bed of compost so much too loose that there is excessive drying, or so much too tight that respiration is restricted to the extent of reducing the crop. Apart from direct injury to the mushroom, such unfavourable conditions may favour competitors in the bed. A further complication, from the

experimental point of view, is that in a loosely packed compost there is less food material per square foot in the same depth of bed.

When growth starts mushroom compost has about 60-75 per cent. of moisture, and the air in its pores is almost, if not completely, saturated. Presumably it would be possible to measure the pF value of compost by a suitable technique, and among other things this might tell us whether the drying which normally occurs during the cropping period is in any way responsible for the cessation of fruiting.

Air Conditions

It will simplify matters to deal with air temperature and ventilation before discussing the properties and effect of the casing.

AIR TEMPERATURES AND RELATIVE HUMIDITY

The ideal air temperature during fruiting is generally considered to be about 60° F., but this is to some extent a compromise. Fruiting occurs, more slowly, down to 50° F., though the bed temperature must be higher. At temperatures over 65° F. it is sometimes difficult to induce fruiting in a new bed, but once it has started, later flushes seem to be very much more tolerant of high temperatures, and as might be expected growth is quicker at higher temperatures. High temperatures, however, favour pests and diseases, so that a temperature within a few degrees above or below 60° F. is preferred.

It is usually said that in commercial houses relative humidity should be at least 80 per cent., but excessively high values encourage disease and may tend to prevent fruiting.

VENTILATION AND AIR MOVEMENT

There has not been much accurate work on ventilation of mushroom houses. Lambert (1933) found that lack of ventilation to the extent of allowing carbon dioxide to accumulate up to 1 per cent. in the air causes abnormal growth, with long stalks, although Stoller (1952) has suggested that substances other than carbon dioxide are responsible. Calculations based on the observed rate of production of carbon dioxide in compost show that this can be removed by one air change per hour.

Middlebrook and Storey (1950) compared yields in three types of mushroom house, with very interesting and important results. They found that yields fell sharply if the air space in the house fell below about 4 cu. ft. per sq. ft. of bed area. There were also some seasonal effects associated with the total cross section of the ventilator openings; none of these houses used fans—see Table I adapted from Middlebrook and Storey (1950).

It might be expected that the effect of lack of air space could be overcome by changing the air more frequently. For removal of carbon dioxide and renewal of oxygen supply this should be true, but unfortunately it would also have other effects, particularly a sharp fall in relative humidity during most of the year, leading to excessive drying of the beds. The only solution to this problem lies in humidification with forced ventilation, which should enable good crops to be grown in a house with more beds in proportion to air space. There are some air-conditioned houses abroad in which this can be done and at least one such farm has recently been started in England.

TABLE I.
COMPARISON OF THREE TYPES OF MUSHROOM HOUSE

	<i>American</i>	<i>Handcraft</i>	<i>Yaxley</i>
Cubic Capacity	9,714	6,160	4,899 cu. ft.
Bed Area	2,500	1,000	840 sq. ft.
Air/Sq. ft. Bed	3.0	5.2	5.1 cu. ft.
Air Outlets	26	2	14 sq. ft.
Cub Capacity/Sq. ft. Outlets			
Sq. ft. Bed/Sq. ft. Outlets	373	3,080	342 cu. ft.
Average Yield	100	500	60
	1.61	2.16	2.64 lb./sq. ft.
Best Month	June 2-09	April 2-96	May 2-82
Worst Month (start of cropping)	January 1-3	July 1-30	July 2-3
Difference	0.79	1.66	0.52
High Yields	June-Aug.	Feb.-June, Nov.	Feb.-Mar., May
Low	Jan.-Mar., May, Oct.	July-August	July-August

Little is known about air movement within the house, but it is said that some "turbulence" is beneficial, and one would expect that some movement is needed to change the air, although this may be partly effected by simple diffusion. The most definite contribution on this point comes from Dutch experiments in which Spoelstra (1953) found that there was excessive drying if the air velocity over the beds exceeded 10 cm. per second (400 yards per hour). The humidity of the air in his experiments was not stated, but would be relevant. Higher air velocities could be tolerated at higher humidities.

It has been observed on some commercial farms that the size of mushrooms is improved by a fan circulating the air inside the house, particularly when there is a very heavy flush and mushrooms are closely packed on the beds. Under these conditions there might well be a tendency for the mushrooms to trap a layer of stagnant air immediately over the casing, unless special measures are taken to move it.

In considering the air conditions in a mushroom house, or indeed a glasshouse or any other building, one thinks of temperature, which is usually fairly constant, and relative humidity, then perhaps ventilation (number of air changes per hour) and air movement in the house. The fact is overlooked that the steady temperature and relative humidity are actually the result of a dynamic equilibrium, and are maintained at constant levels at the expense of differences in less obvious directions. For example it is normally quite easy to maintain a temperature of 60° F. and relative humidity 80 per cent. in a good mushroom house in March and in May. In both cases air coming into the house is being heated if necessary, and humidified, the latter mainly by evaporation from the casing. In March with the outside air at a lower temperature

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and absolute humidity, considerably more water is removed from the casing than in May. This in turn requires more frequent or heavier watering, with consequent effects on temperature and the porosity of the casing. Perhaps it is surprising that seasonal effects are not even greater than they are.

Casing Soil

Although a few mushrooms may sometimes be formed on a bed of compost without casing, and sometimes even grow underneath it, this is rare, and a commercial crop is only obtained if a suitable casing is laid on the bed. The essential function of this casing is still unknown. We know that casing soil is necessary and that a pH between 6 and 8 is essential (Lambert and Humfeld, 1939). Recent work shows a pH of 8 to be optimum. The casing must be kept moist and there is some indication that, under conditions obtaining in Britain, a heavy soil is rather better than a light sandy one. (Bewley, 1946 and Atkins, 1950).

There is no completely satisfactory evidence to show that the casing need supply any nutrients, and quite good yields have been obtained on casing media which must be regarded as nutritionally quite inert, such as broken tiles and bricks (Bels-Koning, 1950,) and under certain conditions on sand. Pizer and Leaver (1947) examined good, bad and indifferent casing soils and were unable to relate their cropping results to the presence of nutrients or to any of the other properties they examined.

AIR AND WATER RELATIONS OF CASING SOIL

The soil layer varies according to management and may be between $\frac{1}{2}$ and 2 inches in thickness. It is normally kept moist, thus maintaining a humid porous layer in which the mushroom rhizomorphs grow, and fruiting bodies are formed. It provides mechanical support for these, though sometimes they are firmly enough attached to the compost not to need further support. The casing allows, but may limit the passage of gases such as oxygen and carbon dioxide between compost and air, by diffusion and possibly in lumpy soils by what might be called mass air movement.

The evaporation of water from the casing plays an important part in the cultivation. In evaporation latent heat is taken up, cooling the bed. Some or even most of this heat may come from the air, whilst some comes from the heat of respiration in the bed. The cooling has been observed experimentally by Flegg (1954), whose figures show the change in temperature gradient through the bed after watering. Temperatures were measured by thermocouples placed at one inch intervals down through the bed. When these observations were started it was hoped they might eventually throw light on the old-established idea that cooling at the surface supplied the essential stimulus to fruiting, but this has not yet become evident.

Water undoubtedly plays an important part in the casing soil and in the air above it. Where mushrooms are grown in ridge beds on the floor in caves, the air is almost saturated, usually about 95 per cent.

relative humidity, air movement is slow, air temperature low (50-55° F.) and evaporation is very slow. Under these conditions the bed temperature rises several degrees above that in the air; there is little demand on the casing for water, and a thin layer, about $\frac{1}{2}$ inch, of a sandy casing with a low moisture holding capacity is quite satisfactory. This type of casing on beds in a house, with relative humidity of about 80 per cent. and temperature 55-65° F. gives poor results and in fact is hardly ever used commercially.

As an example of the effect of air conditions and management on evaporation from the casing, some measurements were made of evaporation and watering on beds cased with peat and sand mixtures in the test houses at Yaxley in April and again in July, 1954 (Edwards, 1955). Petri dishes with and without casing were placed on the beds so that they would receive their share of any watering, and would dry like the rest of the bed. They were weighed daily and also immediately before and after each watering. Thus it was found how much water was applied, how long it took to evaporate, and in fact a daily water balance sheet could be constructed. The average rate of evaporation in April, when the houses were being heated, was 1 oz. per sq. ft. per day and in July, without heating, 0.4 oz. per sq. ft., less than half as much.

In houses with absorbent walls, such as brick, some water may be absorbed by the walls at times of high humidity and given up when the atmosphere dries, thus reducing evaporation from the beds.

The importance of management in relation to cropping performance of a particular casing soil is vividly illustrated by the experience of two mushroom growers who exchanged enough of their soils for each to case about 100 sq. ft. of shelf beds with the other's soil. Both soils gave reasonable crops on the "home farms," one being a little better than the other, but when transferred to the other farm under the other grower's management they were both failures. Although these were not scientifically designed and controlled experiments, the growers concerned are very capable and the result must be accepted as genuine.

Properties and Effects of the Casing

In her experimental approach to the problem, Bels-Koning (1950) compared soils of relatively high and low moisture holding capacity and found the former gave better yields. She also used broken tile graded by sieving, and mixtures of the fine and coarse grades, finding that a medium grade of tile (2.4-5 mm.) was the best of the single grades, but a mixture was better still. She also found that a wet casing soil was better than a dry one on dry compost, but a dry casing soil was better than a wet one on wet compost. Two things were abundantly clear from this work, that moisture relations and porosity have important effects, and that the subject is full of pitfalls due to extraneous factors.

Our own work (Edwards and Flegg, 1952) started with a comparison of three soils of very different types, all in regular use as casing soils. We tested their water holding capacity by a suction method, for which

we are indebted to Dr. Tinsley's co-operation, and we plotted approximate percentage moisture/tension curves. These soils were then used for casing in very small cropping units, under various watering treatments. The comparisons between soils were not very satisfactory, but fruiting was depressed on any of the soils if the tension rose above pF 4.2. The differences in the measurable physical properties, namely, water holding capacity and pore space, were not very great, and were complicated by differences in organic matter content and other factors, so this approach was abandoned, at least temporarily.

The problem was then approached from the other direction by making up artificial mixtures to give a wider range of physical properties, which could be varied independently of each other, in an attempt to find the limits, if any, within which a satisfactory casing must lie, or whether any single property was a predominant factor (Edwards & Flegg, 1953).

The mixtures were made from sand, peat, vermiculite and the local clay loam subsoil at Yaxley, the first three being mainly used for the ranges of artificial mixtures. In using these very light materials it is essential to think of the moisture in the casing on a volume, not weight, basis, and this is preferable also with soil, because the moisture per square foot is what matters. Two complications emerged:—vermiculite appears to be toxic when used alone or with sand, and peat is too variable owing to its compressibility. The toxicity of vermiculite appeared to be neutralised in the mixtures with peat, and to a small extent with the clay soil. This toxicity may be due to the magnesium, which can be leached out of it, or possibly to the shape of the moisture/suction curve.

However, it appeared that the best mixtures were those containing peat with the highest pore space in the dry state. These were general trends, and there were some exceptions, so the findings could not be applied uncritically in choosing casing material or mixtures previously untested. Nor do they explain adequately the differences between natural soils. In general, these artificial casings should be applied fairly wet, with pF below 2.0, and should be rather thicker than with soil, say $1\frac{1}{2}$ -2 inches.

A further limitation is that the observations were necessarily made under our very imperfectly controlled cropping conditions, and the results might quite possibly have been different if these had been very much altered.

General Conclusions

The mushroom's environment consists of three media, the compost, casing, and air. The compost must be porous and moist, but the limits of porosity and moisture are not at all well defined. The casing must be porous and, under typical mushroom house conditions, should have a high moisture holding capacity. Soil casing must be maintained moist enough to keep the pF below 4.2. With artificial peat casings a value below 2.0 is probably better. The exact requirements for the casing are related to the surrounding air conditions, and any particular casing has its own requirements as to management of watering, ventilation and air movement if the best results are to be obtained from it.

The air temperature should be about 60° F., the relative humidity should be probably over 80 per cent., though precise information is lacking.

One air change per hour is enough to provide for the known gaseous exchange due to metabolism.

Some air circulation within the house is needed, but if this is excessive the casing dries too rapidly.

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HOSPITALITY ABUSED

Messrs. A. G. Linfield Ltd., recently opened their Wiston Nursery for inspection by anyone interested. On one of the days, Friday, 31st May to be precise, at a time when the Directors were unavoidably engaged elsewhere at a Public Enquiry of considerable concern to the Company in particular and the cause of Agriculture in general (under normal circumstances one Director would have been in attendance), a certain local Grower whose identity is known to Messrs. Linfields chose to enter one of the mushroom houses together with some members of his staff, carefully closed the door and commenced to measure up and take particulars of the newly installed air conditioning system. This necessitated their clambering about amongst the staging and mushroom trays, conduct which, had an employee been guilty of it, would have earned instant dismissal because of the danger of contamination from the floor and damage to the crop.

This is not by any means the first time that Messrs. Linfields have found that their policy of co-operation has been abused and this latest incident may well cause them to feel that such facilities should be withdrawn for the future.

WRA

WORLD'S PRESS DIGEST

A dozen mushroom-growers in the Oise department are co-operating with the Montesson experiment station in concurrent trials with a synthetic compost. These trials will be repeated during different seasons of the year.

French Federation Bulletin, May/57.

We are NOT at this time making any recommendation for this treatment of fresh-market mushrooms (But) the advantage of washing mushrooms, to our minds, far outweighs the disadvantage of expense that it will ultimately involve. The washing and treatment of other fresh market produce is an established fact; therefore, this process will not be setting a precedent.

Donald Hughes, of Delaware University, in *AMI News*, April/57.

Results (of physical analyses made on soil types formed on the pumice sands of the Taupo ash shower, New Zealand) showed that pumice soils, in comparison with other minerals soils, were high in organic matter and low in bulk density. They had very high total and macro-porosities and the pF curves showed they had much higher moisture contents than a non-pumiceous silt loam at corresponding pF values, being more comparable to peat.

R. Q. Packard in *Soil Science*, April/57.

A review of the literature shows that considerable differences in resistance to insecticides may occur during an insect's life-cycle.

C. Potter in *Chemistry & Industry*, 1178-1181, 1956.

Experimental evidence indicates that auxin acts primarily by loosening the walls of cells which then absorb water and expand osmotically.

R. Cleland & J. Bonner in *Plant Physiology*, 31, 1956.

Growth of azotobacter, radiobacter, and ammonifying, dextrifying and aerobic cellulose-fermenting bacteria was depressed within a zone around granules of superphosphates placed on agar plates, but stimulated outside this zone; no stimulating effect was found for actinomycetes and fungi.

K. P. Tulaikova in *Mikrobiologiya*, 25, 1956.

A race of *Ditylenchus dipsaci* caused severe damage in certain fields of lucerne in Great Britain.

E. B. Brown & J. B. Goodey in *Plant Pathology*, 5 (1), 1956.

Sporobolomyces, together with *Rhodotorula*, was found to be a dominant element in the yeast flora on grains of barley in Denmark examined after the very hot and dry summer of 1955.

Aage Lund in *Friesia* 5 (3/5), 1956.

The mushroom industry needs research and more research. This means research to develop finer quality, greater uniformity and longer shelf life. This means research to develop improved methods of growing and handling and disease control. This means research in packaging and marketing—research all along the line and without end.

Robert Knox in *AMI News*, April/57.

Experiments have been carried on applying the casing soil from 3 days to 26 days after spawning. Later casing eventually caught up with the earlier ones in production, and the best time to case can only be determined by the condition of the compost, the depth to fill, and the length of time the crop will remain in production.

Dr. Lee Schissler in *AMI News*, April/57.

At the Bacteriological Division of the Canadian Department of Agriculture, fungicidal paints in general, particularly those containing organic mercury salts, showed considerable promise. Effective concentration of fungicide was found to vary with temperature.

A. H. Jones, J. G. Desmarais and K. E. Winfield in *Canadian Paint Varnish Magazine*, May/56.

It's arrived—the fourth dimension of selling. Fragrance Process Co. Inc., of New York, USA, are marketing a jelly-like compound which can be impregnated with any aroma, and which in turn can be transmitted to paper by a printer in the same way as an overprint or varnish.

Business, May/57.

With the Furmanite system, steam leaks can be sealed without dismantling or even reducing steam pressure. Cartridges of a thermosetting plastic are loaded into an injector gun. The heat of the escaping steam is used to melt the plastic, which is then injected into the leaking joint. Marketed by Furmanite Sales Co. Ltd., Grand Buildings, Trafalgar Square, London, W.1.

Business, May/57.

● UP AGAIN

EVERY MONTH — AND FOR MANY MONTHS NOW

MOUNT SPAWN

Sales INCREASE

● HERE IS ONE OF THE REASONS WHY—

From : Capt. A. Sanford,
Searles Gardens,
Fletching, Sussex.

J. E. R. Simons Ltd.,
Natts Farm,
Harlow.

Dear Sirs,

Seeing the reports of various Mount users in your adverts in the Bulletin from time to time, I thought you would be interested to know of my own results.

You will be aware that I have now spawned regularly with your Mount White, both Moist and Granular, for close on two years and during this time have used many hundreds of cartons. We grow in the standard Danish fish box (composted stable manure) and crop for six weeks. Over a period of twelve months we have averaged 1.9 lb. per sq. ft., several crops exceeding 2 lb., and latterly it has been the exception rather than the rule to crop less than 2 lb. In fact our best crop recently has done $2\frac{3}{4}$ lb. As a point of interest, this has occurred since we adopted your suggestion of spawning with 25% of your White Grain, in addition to the Moist White manure spawn.

An outstanding feature of our cropping has been the really excellent quality of mushroom produced. We are delighted with the results and you may use this tribute as you wish.

Yours faithfully,
(signed) A. Sanford.

MOUNT SPAWN IS AVAILABLE
MOIST, DRY, GRANULAR AND GRAIN

SOLE DISTRIBUTORS :

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HARLOW - - - - ESSEX

Telephone : Potter Street 65, 222, and 223

At which point is prepacking best carried out? In Mr. E. G. Broome's opinion, the wholesaler, with the facility of large bulk supplies, is the ideal medium Through a wide range, Broome & Green hope to encourage pre-pack sales not only by the traditional greengrocer but through grocers' shops and stores of all kinds Mushrooms are among the commodities handled in various types of prepack.

Produce Packaging, May/57.

A Swiss machine that will sterilize soil by using its own moisture content, and do it in ten seconds, made its debut in this country recently. A portable unit comprising an adjustable revolving drum with internal "flights," a hopper at one end and an oil burner which throws a flame (creating a flash temperature of 500 to 1,200 deg. C.) across the soil at the other end, it is claimed to reduce costs by up to 50 per cent. against normal methods. It is handled in this country by Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18.

Nurseryman & Seedsman, May 9/57.

Glasshouse ventilators which open or close according to the temperature, without attention of any sort, will shortly be possible, as a result of a new device which is about to be marketed by A & N Contractors Ltd., 100a Clapham Park Road, London, S.W.4. It is known as the Thermoforce window control unit. Price of small model £4 18s. 6d.

Commercial Grower, May 10/57.

For the construction of glasshouses, mushroom sheds and other types of outbuilding, a scientifically developed, lightweight concrete block known as Lignacite is available from builders' merchants or direct from the factories of Lignacite (North London) Ltd., Meadgate Works, Nazeing, Essex A 4 in. solid block affords insulations equivalent to that of an 11 in. cavity wall of brick.

Nurseryman & Seedsman, May 16/57.

The Banks should appoint their own farm credit officers and develop closer co-operation with the NAAS and the University Agricultural Economics Departments, writes Mr. Alan Harrison in a recent issue of *The Farm Economist*. This is his answer to the criticism, which he thinks has some justification, that the Banks are over-concerned with obtaining collateral security.

Agriculture, May/57.

A new dual-purpose two-wheel tank trailer which carries freight and liquids simultaneously has been produced by M. F. Robertshaw Ltd., of Bletchley, Bucks. Applications include carrying water and cement to make concrete. Prices are £135 to £165.

Scope, May/57.

Last year, when we received a six-ton load of really tough straw, pithy inside, the result was a crop half our average. What can we do? The new strains of wheat are almost certain to have tougher-than-before straw.

Fred. C. Atkins in Nurseryman & Seedsman, May 23/57.

Byron Horticultural Engineering Ltd., Hucknall, Notts., is producing a "Saltometer" which, as its name implies, is designed to determine the soluble salt content (pC value) of the soil. The meter, which sells at 15 guineas, gives a direct reading, and no calculations are required.

Commercial Grower, May 31/57.

DDT is of little value against springtails, but the more expensive insecticides malathion and diazinon appear to be as effective as BHC.

B. C. Moreton on Springtails in Grower, May 25/57.

Practical advice to newcomers in pre-packaging, with particular emphasis on catering for individual requirements, is offered by the newly-formed company, Flexothene Ltd., London, S.W.1, manufacturers of polythene bags, lay-flat tubing and sheeting.

Commercial Grower, April, 19/57.

The results of the January, 1957, census of crops grown in glasshouses in England and Wales reveals that the area given over to mushrooms has increased by 8 acres (26 per cent.). The area in January, 1956, was 31 acres.

Fruit Trades' Journal, May 25/57.

Although it was the unanimous opinion of an MGA Sub-Committee that a progressive industry should have its own experiment station, the financial aspect was so formidable, the availability of technical personnel with the rather specific qualities so doubtful, and the priority of problems so likely to lead to controversy, that the

report was filed away Yet the wretched alternative is the situation facing us to-day, with each individual grower dissipating his energies, at no little financial cost, in ill-considered and improperly-analysed trials.

Fred. C. Atkins in *Nurseryman & Seedsman*, May, 23/57.

Ameloration of the growers' lot must come very largely through institutions evolved by the industry itself. The almost insuperable difficulty is to get growers to agree on what ought to be done, and stay in agreement long enough to do it.

Mushroom News, April/57.

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Soil Science, The Williams & Williams Co., Baltimore 2, Maryland, USA.

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If the journals referred to are generally available, they are most easily obtained by placing an order with your bookseller or stationer.

KENT FARM WALK THIS MONTH

Shelf System—Two-storey Houses

Much interest has already been evinced in the farm walk which is to commence at 2.30 p.m. on Saturday, 20th July, at Combe Bank Market Gardens Ltd., Sundridge, Near Sevenoaks, Kent, where Major A. L. A. Dredge has 17,000 sq. ft. of mushroom beds, all on shelves and in the American type two-storeyed houses.

Major Dredge, who had a distinguished career on the N. West. Frontier, was formerly in the Indian Political Service. Later he was with the Foreign Office spending some years as First Secretary at Bahrain in the Persian Gulf. He was for three years on the London Stock Exchange before finally taking up full-time mushroom growing at Sundridge, where he has been for four years.

At Combe Bank the specialization includes oil heating and sterilization whilst, on the marketing side, Major Dredge is a great enthusiast for pre-packing. Mrs. Dredge is a most active partner in the Combe Bank undertaking which, in addition to mushrooms, includes runner beans, strawberries and blackcurrants, all of which appear to thrive on mushroom compost.

The walk is being arranged by Major and Mrs. Dredge under the auspices of the Kent, Surrey and East Sussex Area Committee of the MGA. Tea Tickets 4/- each—available at the farm gate.

ODDS AND . . .

HAVE YOU JOINED YET?

The provident scheme for members of the MGA has now been successfully launched with the British United Provident Association but if the scheme is to be a success more members are urgently required.

This provident scheme was fully outlined in the April MGA *Bulletin* (p. 141) and the immediate response was sufficient to get the MGA Group under way. The object of the scheme is to safeguard members and their dependants against the expense of treatment for major illnesses and, by joining the group, a saving of 20 per cent. in contributions is achieved. If you are already a private member of B.U.P.A., why not change to the group right away? If you are not already a member and would like further particulars write to the MGA Secretary.



ANY OFFERS?

Two Hungarians, one aged 19 and the other 21, who came to this country following the upheaval in their own country a short time ago, are anxious to find work on a mushroom farm in England.

The elder of the two, son of a Hungarian farmer, speaks excellent English, whilst the younger can also speak English a little. These two young men wish, if possible, to work together and if any member is interested will they please communicate direct with Miss R. D. Clarke, The Miners' Hostel, Nottingham Road, Alfreton, Derbyshire, mentioning the MGA at the same time.



SIR WILLIAM SLATER, F.R.S.

The mushroom industry offers its sincere congratulations to Sir William Slater, Secretary of the Agricultural Research Council, on his election to Fellowship of the Royal Society. It was at the MGA luncheon in 1949 that Sir William was Guest of Honour.



WOULD YOU BELIEVE IT!

Mr. J. Stewart-Wood of Aylesbury Mushrooms Ltd., Aylesbury, Berks., member of the MGA Executive Committee, has his own plane and also likes to drive fast cars—very fast. Recently he sustained a broken leg—*falling off a motor scooter!* He is making excellent progress.

According to the *Dublin Evening Herald* a man who appeared in the Putaruru court, New Zealand, charged with being idle and disorderly was stated to have been living on mushrooms and methylated spirits. He was sent to prison for six weeks.

The **CULVERWELL**

Manure Turner **FOR MUSHROOM GROWERS**

PETROL or ELECTRIC

EXTREMELY
MOBILE

£225
Ex Works

*The
small
machine
with the
BIG
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Bruises and aerates—does not shred. CAN BE USED FOR ALL TURNINGS. 3 men handle 25/50 tons per day. Waters as it turns. Stacks up to 5 feet. By using the CULVERWELL MANURE TURNER throughout the whole composting process, the work is reduced to the minimum, time taken is shorter with improved results.

Will pass through a door 2' 10" x 5' 10" with the detachable wheels removed

E.O. CULVERWELL *Ltd.*
MALLING WORKS LEWES · SUSSEX *Telephone*
LEWES 637
(5 LINES)

THE USE OF DNC BY MUSHROOM GROWERS

The precautions necessary to protect employees in the mushroom-growing industry against the risks of poisoning arising from the use of DNC (sodium dinitro-ortho-cresol) fall into two categories:

- (a) those which are legally enforceable under the Agriculture (Poisonous Substances) Regulations, 1954 (Statutory Instrument 1954, No. 828);
- (b) those which are advisable but not prescribed by the Regulations.

So far as (a) is concerned the interpretation of the Regulations is the ultimate responsibility of the Courts but attention is drawn to the following points:

- (i) the definition of the term "greenhouse" includes any enclosed building—Regulation 3 (1);
- (ii) the Regulations apply only to "workers" as defined in Regulation 3 (1);
- (iii) the protective clothing to be worn for various operations is listed in Part II of the First Schedule to the Regulations. The operations likely to be undertaken by workers employed by mushroom growers appear to be those numbered 1, 2, 3, 7 and 8 in the Schedule.

Operations which are not covered by the Regulations are (i) the dipping of wooden trays or boxes; (ii) the carrying, handling and stacking of treated trays or boxes; and (iii) the spraying of paths, roads, etc., around the mushroom sheds. In the Ministry's view it is desirable that certain precautions should be taken by workers carrying out these operations. On the present information the Ministry would recommend that the clothing set out in the right hand column below should be worn during the operations described in the left hand column:—

- | | |
|---|---|
| (i) dipping, handling, carrying or stacking away dipped trays .. | rubber apron,
rubber boots,
rubber gloves. |
| (ii) handling, carrying or filling dry treated trays | rubber gloves and
rubber apron. |
| (iii) spraying road, paths, exteriors of sheds, etc., with DNC .. | overall, hood,
rubber gloves,
rubber boots and
either face-shield
or dust mask. |

High temperatures when using DNC are likely to lead to increased absorption and to make any absorption more dangerous. It is, therefore, important to keep the temperature of houses as low as possible when DNC is being used in them and during the period immediately following use if it is necessary for the houses to be entered. We recommend that DNC should not be used when the temperature in the houses exceeds 70° F. and that trays or boxes which have been dipped in DNC should be allowed to dry in a free current of air before being placed in a peak-heating room.

Agricultural Wages Branch I,
Ministry of Agriculture and Fisheries,
5/8 St. Andrew's Place, N.W.1.

S.L.Y. 34,359

IRISH FARM WALK PICTURES



1. Pictured above is a general view of most of the visitors taking part in the Irish farm walk at Irish Nurseries Ltd., Kimmage Road, West, Dublin, on Saturday, 25th May.



2. New air conditioning features proved of absorbing interest to the growers, four of whom are here seen making a close examination of polythene tubing in use as an air duct.

OVER 1 MILLION PAPER BAGS SOLD

It was reported at a meeting of the MGA Publicity Sub-committee on 20th June, that, to date, 1,128,000 publicity paper bags had been disposed of through the normal trading channels by Messrs. Hobbs of Maidstone, Kent. This figure does not include the 70,500 distributed free to MGA members for Publicity distribution. In addition, 107,000 of the larger type bags (10" x 10") have also been disposed of, making a total of over a million and a quarter bags in circulation.

Bearing in mind that straight sales of bags concerns only the South East of England in the main, the figures for this purely pilot scheme are most promising.

The Publicity Committee immediately issued instructions that, in view of the successful reception of the bags, the scheme should immediately extend to the whole country and the Secretary was instructed to negotiate with other manufacturing and distribution firms without delay.

That the bag, at the price, has had a good reception by the retail trade is becoming rapidly obvious and if the early promise is maintained, the committee's target of 20 million bags will be reached without difficulty. Indeed, it seems quite possible that some restriction may become necessary owing to the slender finances behind this MGA publicity campaign.

Negotiations for the bags to be offered to retailers in London and the Home Counties, East Anglia, the Midlands, Lancashire, Cheshire and the North West in general, to Yorkshire and the whole of the North East including Northumberland, are already under way and it is only a matter of time before similar steps are taken with regard to the West Country, Wales and N. Ireland.

—AND MORE PUBLICITY

Did you know that mushrooms figured prominently on the NFU Market Produce Show Society's stand at Chelsea, which was awarded a Gold Medal! Mushrooms were sent by MGA members in Kent, Surrey, Sussex and elsewhere and included some of the new tray-type prepacks of the Hartman Fibre Co., covered with British Celanese "celawrap."

At the Three Counties Agricultural Show at Guildford too, mushrooms were on display and excited considerable comment. These mushrooms were supplied by Mr. P. B. Stanley-Evans of Shackleford Nurseries Ltd., Eashing, Surrey, member of the MGA Executive Committee.

Prepacked mushrooms have never been more prominently displayed than at the Royal Agricultural Show being held early this month near Norwich.

Major A. L. A. Dredge of Combe Bank Market Gardens, Sundridge, Sevenoaks, Kent, with Mrs. Dredge, put in a tremendous amount of hard work arranging the display, in the NFU Market Produce Show Society's tent, and the exhibit was entered for *The Grower* competition.

A full description of this exhibit, together with a picture, will appear in the next issue of the *MGA Bulletin*. Briefly, the main design showed the letters MGA in blue half-pound cartons in bold relief against a background of the new Hartman Fibre white trays. On one side in the foreground were a number of American-type packs whilst, on the other, a number of other English-type cartons were also shown.

LAST MONTH'S PUBLICITY CONTRIBUTIONS

Contributions to the MGA Publicity Fund last month included the following: -

***Spawn Merchants** : W. Darlington & Sons Ltd., Southcourt Road, Worthing
Monlough Food Production Co. Ltd., Ballygowan, Belfast

Salesmen : †C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield .. £3 2 7

*Amounts donated by spawn merchants are not for publication.

†Previous contributions already acknowledged.

MANURE SWINDLE Two Men Sent To Prison

At the last Essex Assizes at Chelmsford, a manure dealer, Kenneth Albert Lack (40), of Chapel Road, Terrington St. Clements, Kings Lynn, Norfolk, was sent to prison for 18 months and Kenneth Carlton Trundley (35), of Rose Cottage, Carlton, Cambridge, received sentence of six months imprisonment for offences involving the short weight of manure supplies delivered to nurserymen and mushroom growers.

It was stated during the hearing that Trundley was employed as a lorry driver by Lack and the offences were described as "A carefully planned swindle."

For the prosecution Mr. V. G. Hines, said Lack was supplying manure to nurserymen and mushroom growers in South East Essex and the manure was of the type highly valued by mushroom producers. A buyer of the manure would be led into believing he was receiving something in the neighbourhood of $4\frac{1}{2}$ tons whereas, in fact, he was receiving about $2\frac{1}{2}$ tons.

Trundley pleaded guilty and Lack not guilty to four counts of uttering forged documents and both defendants pleaded not guilty to a charge of conspiracy to defraud.

MUSHROOM GROWERS CRITICAL

When the Glasshouse Crops Research Institute held its first "Open Day" at Rustington, near Littlehampton, last month, Mr. T. Ainslie Robertson, Chairman of the Institute's governing body said at a luncheon party, that some people, especially mushroom growers, had been very critical of the progress so far made. He agreed there was room for criticism and added, "... and I can only say that I go from time to time to Her Majesty's Treasury to try to wring pounds sterling from them."

Mr. F. W. Toovey, Director of the Institute, said that tenders had already been received for two mushroom growing houses, a turning shed and field laboratories. Meanwhile experiments were being carried out in the existing houses brought from Cheshunt and "much improved." Later he said "If we could unravel the secret of casing we could go a long way to better and more continuous yields."

PUBLICITY SUBSCRIBERS

—1957 LIST—

Salesmen:—	£	s.	d.
Francis Nicholls Ltd., Smithfield Market, Birmingham	157	10	0
R. E. Jenkinson Ltd., Covent Garden Market, W.C.2.. ..	105	0	0
T. J. Poupart Ltd., Covent Garden, London, W.C.	100	0	0
Dan Wuille & Co. Ltd., Covent Garden Market, W.C.2	50	0	0
Wm. Artindale & Son Ltd., Castlefolds Market, Sheffield	21	0	9
J. Collingridge Ltd., Covent Garden Market, W.C.2	25	0	0
Geo. Jackson & Co. Ltd., Smithfield Market, Birmingham	5	5	0
Ed. H. Lewis & Sons Ltd., Covent Garden Market, W.C.2	5	5	0
A. E. Phippen (Brentford) Ltd., Brentford	5	5	0
C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield	18	3	5
Marks & Co. Ltd., Covent Garden, London, W.C.	1	1	0
J. Stratton Ltd., Salesmen, Spitalfields Market, London, S.E.1	5	5	0
Mitchell Bros. (Andover) Ltd., Salesmen, Vigo Road, Andover.. ..	2	2	0
Sir Ernest Shentall Ltd., Salesmen, Chesterfield, Derby.	2	2	0
Herbert Hitchcock & Son Ltd., Salesmen, Boro' Market, S.E.1.. ..	5	5	0
Wm. Morgan & Co. Ltd., Salesmen, Custom House Street, Cardiff	10	10	0
Ernest White Ltd., Salesmen, Kirkgate Market, Leeds	5	0	0
Jas. Blackburn (Manchester) Ltd., Salesmen, Smithfield Market, Man.	10	10	0
C. W. Tooley & Son Ltd., Salesmen, Nottingham	2	2	0
Wm. Tolley & Son Ltd., Wholesale Market, Nottingham	2	2	0
G. E. Leatherland Ltd., St. Andrew's Street, Newcastle-on-Tyne	66	16	6
Geo. Stansell Ltd., Spitalfields Market, E.1	10	10	0
Barnes Bros. (Brentford) Ltd., Brentford	5	5	0
P. & T. Fitzpatrick Ltd., 22 Queen Square, Liverpool 1	5	5	0
Wm. Bulman & Leatherland Ltd., 30 St. Andrew's St., Newcastle-on-Tyne	5	0	0
Jackson & Lakin Ltd., Nottingham	3	5	6
Reuben Levy Ltd., 88 Spitalfields Market E.1	8	9	2

Sundriesmen, etc.:—

Thomas Elliott Ltd., Eagle Mills, New Church Road, S.E.5	10	10	0
Shirley Organics Ltd., Vicarage Wharf, Battersea, S.W.11	25	0	0
Stable Manures Ltd., Manure Dealers, Worthing and Newmarket	60	0	0

***Spawn Makers/Merchants:—**

H. Mount & Sons Ltd., Littlebourne, Canterbury.
W. Darlington & Sons Ltd., Southcourt Road, Worthing.
Monlough Food Production Co. Ltd., Ballygowan, Belfast.
S. A. F. Sampson Ltd., Oving, Chichester.
Geo. Monro Ltd., Hertford Road, Waltham Cross.
Pinkerton's Scottish Mushroom Laboratories, Millerston, Glasgow.
Agricultural & Chemical Co. Ltd., 51 Barbican, London, E.C.1.

*Amounts collected by Spawn Merchants are not for publication.

SEEN THIS?

The handy sized barrow for transporting trays, seen in the accompanying picture, is the work of Mr. W. Hall of Floral Farm, London

Colney, Herts. The metal piping was brought from a scrap yard and totalled 22 ft. in length, made up of:— 2 lengths, each 1' 10" $2 \times 2' 10"$, $2 \times 2' 2"$ and one each of 1' 1", 1' 8", 1' 9" and 2', plus a couple of wheel brackets, the 14" $\times$ 3" pneumatic wheel and two legs, all held solidly in place by solder. "It didn't take very long to make, it does save a lot of labour and it cost only about £5 plus my own time," said Mr. Hall.



As an added precaution don't forget to mix Lindex Dust with your compost

The

HORRID PHORID

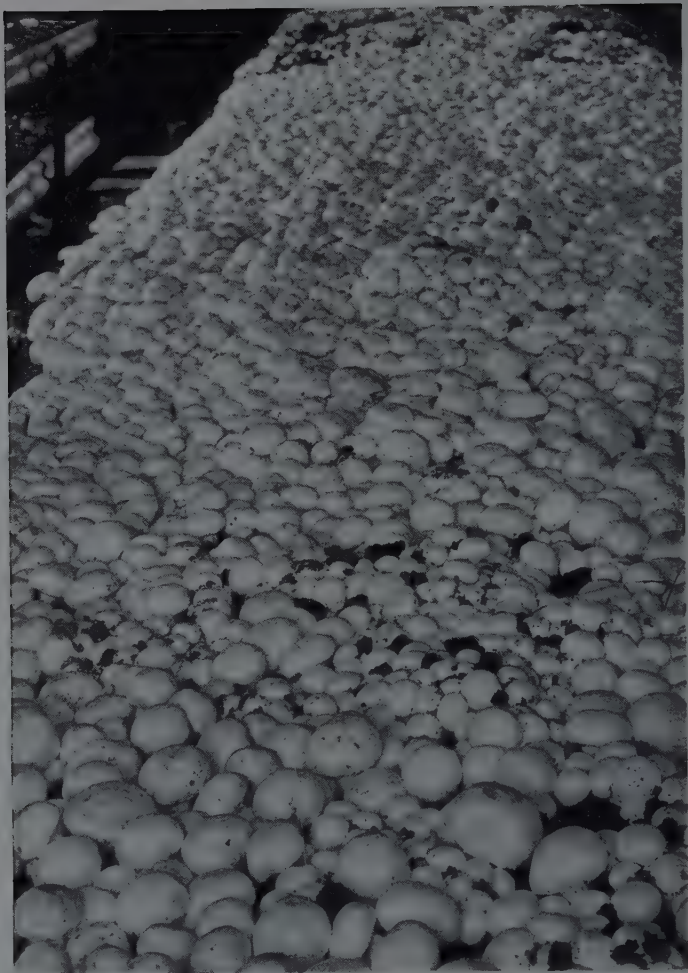
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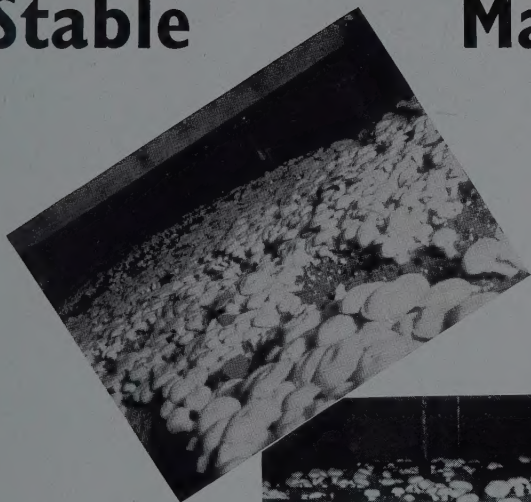
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